LARGE MAMMAL SURVEY OF THE PROPOSED WOODLAND ROAD

Prepared for

Kennecott Eagle Minerals Company

By

Iron Range Consulting & Services Inc.

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Introduction

This study was conducted by Iron Range Consulting & Services Inc.; James H. Hammill the principal investigator. The curriculum vita of Mr. Hammill is presented at the end of this report. The study was conducted for Kennecott Eagle Minerals Company of Ishpeming, Michigan as part of due diligence studies associated with a proposed road referred to as Woodland Road.

Purpose

The purpose of this study was to determine which large mammals are present along a proposed road corridor from a point approximately two miles north of Humboldt (T48N-R29W, Section 26) to a point at the intersection of the Triple A Road and an existing snowmobile route (Trail 5) in T50N-R28W, Section 18 of Marquette County, Michigan (Appendix #1). The monitored area is a road/trail system approximately 24.4 lineal miles in length and follows existing gravel, sand, and cobble roads and trails for its entire length. The system is oriented in a north-south pattern. As a result of this survey, large mammals may be classified as "present" or "not documented". We recorded and verified the presence of any large mammal that left spoor in the form of tracks or droppings, from images that were captured on infrared digital trail cameras, and also from visual sightings.

Study Area Description

Ecologically, this area is described as part of the Humid Temperate Domain, Humid Warm-Summer Continental Division, Laurentian Mixed Forest Province, Precambrian Shield Bedrock, Late Wisconsin-age Glaciated Landscape (Bailey and Cushwa, 1981). The transects followed existing roads and trails in western Marquette County, Michigan. The transects were either part of, or very near a proposed road that may be constructed for the purpose of access to northwest Marquette County.

Ecologically, this area has been described as the Michigamme Highland, an area characterized by Precambrian granitic and sandstone bedrock knobs, rocky ground moraine, bedrock lakes, localized outwash plains, northern hardwood forest, white pine-red pine-red oak on bedrock,

balds, and localized jack pine barrens. Both the southern and northernmost transects passed over jack pine barrens while most (78%) of the transects passed through northern hardwood forests, balds, swamp conifers, and to a lesser extent, aspen. The entire route transects second growth forests whose origins are the early part of the 20th Century. Most mature forest cover is 70-90 years old. Nearly all of the area shows some evidence of recent timber cutting operations (during the past 30 years). Northern hardwoods generally have been managed by select cutting practices, leaving basal areas between 40-80 sq. ft. basal area. Most swamp conifers have either not been cut, or cut very lightly. A limited amount of aspen cutting has occurred as small clearcut pockets that are regenerating nicely. Some clearcutting of hardwoods has occurred for the purpose of converting these sites to red pine plantation. Elsewhere, jack pine has been clearcut and natural regeneration is beginning to re-vegetate these sites. The northern hardwood forest type predominates on this entire area and therefore deserves special attention as to its condition. The presence of many species of wildlife is directly dependent upon forest attributes, especially within stand characteristics. The northern hardwood forests along the survey route have been influenced by the activities of man. Historically these stands may have had up to 50% of their volume composed of mid-density hardwoods or softwoods such as white pine and eastern hemlock. Most of that component was removed in the first large scale cut that occurred during the time period from 1890 to 1930, which affected nearly every acre of the Upper Peninsula. Some remnant trees from that era remain. However, most softwoods found in the northern hardwood forest type are nearly the same age as surrounding trees (70-90 years of age). Although these softwoods compose a small percentage of total stand volume, their presence is disproportionately important to wildlife, especially fisher, pine marten, porcupine, moose, white-tailed deer, and black bear.

Except for private lands found in the Huron Mountain Club and the USDA administered McCormick Research Natural Area, the study area appears to be representative of the surrounding Michigamme Highlands both in vegetative composition and human use. Both the Huron Mountain Club and the McCormick Tract have experienced less human use and have working forests that have older age-class vegetation and a less frequent cutting history. The Michigamme Highlands is an area of 1,182 square miles with elevations that vary between 602 feet (at Lake Superior) to 1,980 feet (Mt. Curwood, Baraga County). The study area has widely varying elevations within these extremes with the broad, flat, lower elevations at both the Yellow Dog Plains (1,446 feet) and to the north the Clowry Area (1,551 feet), having lowest elevations. Various locations along the study area approached 1,800 feet elevation.

Annually, climate conditions are heavily influenced by the proximity of Lake Superior. The study area commonly receives winter snowfall totals that exceed 200 inches (Albert, 1995). Some large home range mammals (e.g., moose, deer) migrate to landscapes with more coniferous cover during winter, thereby vacating deep snow areas. Others (e.g., coyotes, wolves) follow their primary migratory prey to these areas during winter. Many other mammals are year-round residents of the Michigamme Highlands and have hunting patterns and life requisites that are independent of the severe winter weather conditions common to this area. Examples of these animals are pine marten and fisher.

The two primary large ungulates in this area are whitetail deer and moose. They represent the most significant prey available to top predators such as gray wolves, black bears, and coyotes.

During winter, deer and moose limit their movements and habitat to areas having conifer which provides effective snow intercept and results in lower accumulated ground totals. Depending on the severity and timing of the onset of deep snow conditions (greater than 16 inches on the ground), deer migrate from the study area during winter months, traveling either north to "yard" near Lake Superior, or south to "yard" in locations providing less snow accumulation and adequate thermal cover. It is possible that in an unusually mild winter period, whitetail deer and their primary predators could inhabit all or parts of the study area. Moose can find food resources even with substantial snow accumulations. However, when snow exceeds 30 inches, moose begin to restrict their daily movements and seek areas that have higher percentages of snow intercepting conifers (Minzey and Robinson, 1991; Ecology and Management of the North American Moose, 2007). These conifers, even in small groups, also provide thermal cover for moose. Moose are much more tolerant of low temperature extremes, however, and do not move long distances to find favorable habitat available in or near the study area during the winter period.

Historical Distribution of Mammals

The Michigamme Highlands are part of the larger northern coniferous forest biome in Michigan (Baker, 1983). Historically, nearly 32% of mammals in Michigan are known to be associated with this biome. These mammals are: Arctic shrew (*Sorex arcticus*), masked shrew (*Sorex cinereus*), smoky shrew (*Sorex fumeus*), pygmy shrew (*Sorex hoyi*), water shrew (*Sorex palustris*), star-nosed mole (*Condylura cristata*), snowshoe hare (*Lepus americanus*), least chipmunk (*Eutamias minimus*), red squirrel (*Tamiasciurus hudsonicus*), northern flying squirrel (*Glaucomys sabrinus*), deer mouse (*Peromyscus maniculatus gracilis*), southern red-backed vole (*Clethrionomys gapperi*), meadow vole (*Microtus pennsylvanicus*), woodland jumping mouse (*Napaeozapus insignis*), porcupine (*Erethizon dorsatum*), marten (*Martes americana*), fisher (*Martes pennanti*), ermine (*Mustela erminea*), wolverine (*Gulo gulo*), lynx (Felis lynx), moose (*Alces alces*), and caribou (*Rangifer tarandus*). Another 35% of Michigan mammals have inter-biome distribution and exhibit adaptations to more than one biome to the extent that they could be considered non-specific in terms of their environmental association. These inter-biome mammals may also be found in the study area. They are: Keens bat (*Myotis keenii*), little brown bat (*Myotis lucifugus*), silver-haired bat (*Lasionycteris noctivagans*), big brown bat (*Eptesicus fuscus*), red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), woodchuck (Marmota monax), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), southern bog lemming (*Synaptomys cooperi*), meadow jumping mouse (*Zapus hudsonius*), coyote (*Canis latrans*), gray wolf (*Canis lupus*), red fox (*Vulpes vulpes*), black bear (*Ursus americanus*), raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*), mink (*Mustela vison*), striped skunk (*Mephitis mephitis*), river otter (*Lutra canadensis*), mountain lion (*Felis concolor*), bobcat (*Felis rufus*), and white-tailed deer (*Odocoileus virginianus*).

Of the above species, wolverine and caribou are thought to be extirpated from Michigan and only sporadic reports of lynx have occurred in recent decades. Although once extirpated, marten, fisher, moose, and gray wolves have recovered in recent decades as a result of translocation/release (moose, marten, fisher) or natural recolonization from populations

elsewhere (gray wolves). Although much conjecture surrounds the existence of the extirpated mountain lion, no conclusive evidence exists at this time to confirm its presence.

Recent Records

Several species of large mammals that are hunted and/or trapped in Michigan exist in the study area. Some of these species are required by law to be registered with the Michigan Department of Natural Resources (MDNR) when harvested. The Township, Range, and Section of each registered animal is recorded. Data from the registered harvest of bobcat, otter, black bear, fisher, and pine marten from the years 2005 through 2008 is presented in Appendix 2. Most of these species would be under-represented using this survey technique, due to their tendency to leave very little spoor due to low body weights or relative scarcity. Registration data suggests that black bears are present along the entire study area route. Black bear tracks are sometimes difficult to detect on rocky or cobble road surfaces and were generally under-represented on our survey.

Methods

A track-transect method was used to determine the presence of large mammals (Wildlife Management Techniques, 1969). The entire corridor was subdivided into 25 one-mile segments (transects) and a record was kept of tracks or other spoor identifiable to a specific species for each road segment during the period 10 June 2008 to 6 October 2008. Remote infrared digital cameras were placed along the route at sites within 10 meters of the corridor. Scent lure was placed at these camera locations to attract mammals. This technique is especially useful to monitor animals that are difficult to track because of light body weight resulting in tracks that are difficult or impossible to identify. Also, this technique is especially helpful along road segments in areas such as these with cobble or ledge substrate on the road surface.

Protocol for each survey day afield required three days since the last rain and not more than 20% road coverage by leaves in order to run the survey. The requirement of three days since last rain allowed time for wildlife movement and track setting. Rain either removed or aged older tracks which helped prevent recounting tracks that may have been previously recorded. When a survey was started, the entire route had to be run during daylight hours and in absence of rain.

All tracking was done from an ATV. The entire route was surveyed in a south to north direction. The ATV was operated at very low speeds (less than 4 mph) and observations were tallied on road segment forms (Appendix #3). Each form was capable of holding data from eight, one-mile transects. Digital infrared cameras recorded images on 1 GB compact flash cards. Cards were replaced on each survey day. Photos were then downloaded, stored, and recorded specific to camera location. In addition to the above, observations of unique wildlife species other than large mammals were recorded. Observations ended on 6 October 2008, when the road-trail system was nearing 20% leaf coverage as a result of leaf fall.

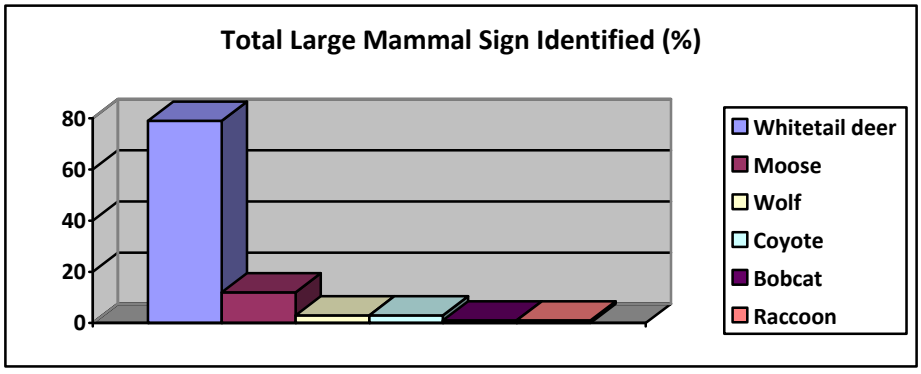
Tracking Results

The survey route was traversed six times, totaling 193.6 miles of tracking data collection. The initial data collection started on 10 June 2008 and the final tracking was done on 6 October 2008. Six hundred ninety-nine (699) tracks of separate animals were recorded and ten (10) different species were recorded. White-tailed deer were the most common species (N = 551) and occurred along the entire study area corridor. They represent 79% (N = 551) of the total tracks identified. Moose were common on the study area and represented 12% of the tracks found (N = 85). Both deer and moose were found on nearly all road segments.

Total Large Mammal Sign Identified (N = 699)

White-tailed Deer	79%	(N = 551)
Moose	12%	(N = 85)
Coyote	3%	(N = 22)
Gray Wolf	3%	(N = 19)
Black Bear	1%	(N = 7)
Raccoon	1%	(N = 7)
Bobcat	<1%	(N = 4)
Red Fox	*	(N = 2)
Fisher	*	(N = 1)
Otter	*	(N = 1)

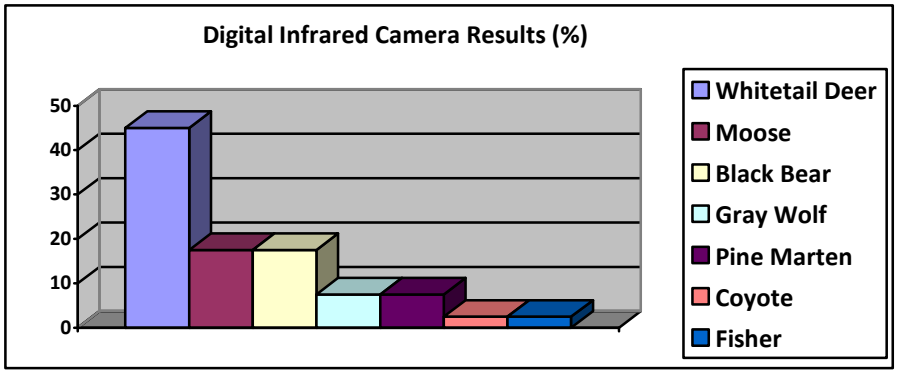
(*Incidental)



Digital Infrared Camera Results

Cameras were placed within 30 yards, and perpendicular to the survey route in three locations on mile segments 12, 16, and 21. The cameras were in operation for a total of 245 camera-days. One camera was lost to vandalism resulting in 73 camera-days of lost data. In total, 7 species were recorded on digital images:

Species	Distinct No. Individuals	% of Total
White-tailed Deer	18	45.0%
Moose	7	17.5%
Black Bear	7	17.5%
Gray Wolf	3	7.5%
Pine marten	3	7.5%
Coyote	1	2.5%
Fisher	1	2.5%
		100.0%



Visual Sightings

During the course of the surveys, several large mammals were sighted (white-tailed deer and black bear). In addition, wildlife sighted incidental to the large mammal survey included wild turkey (*Meleagris gallopavo*), sandhill crane (*Grus canadensis*), goshawk (*Accipiter gentilis*), broadwing hawk (*Accipiter cooperii*), and American woodcock (*Philohela minor*).

Discussion

This survey combined track/spoor identification with visual sightings and digital imaging technology. The intent was to document the presence of as many large mammals as possible of the expected resident fauna of this area. This work was not intended to result in population estimates. The survey techniques used accomplished the goals of the project.

Large home range species tend to be habitat generalists. This is especially true for predators such as wolves, coyotes, and bobcats. They tend to utilize most of their home range over time. Therefore, tracking and camera monitoring over a longer period of time, 116 days in this study, should result in a good representation of the species using this corridor. There are a number of sources of error that should also be considered. Some animals will be under-represented in the survey due to the fact that they leave very little observable sign, even on good tracking substrate. Examples of these species might be fisher, marten, foxes, and weasels. Every effort was made not to double count tracks, however it is possible that double counting did occur, especially with whitetail deer. Also it is possible that some species were present but not recorded either by tracking or cameras.

Only one endangered large mammal, the gray wolf, is known to exist in the study area. Two areas of the survey segments had significant and repeated wolf sign. These were mile segments 6 through 14, and 17 through 24. According to MDNR records, no known wolf den or rendezvous (young-rearing) sites exist along the study route and the nearest of these critical habitats is approximately 5 miles west-northwest of the northernmost point of the survey (conversation with B. Roell, MDNR). Wolf sign observations suggest that two family groups may exist along the survey route at the mile segments aforementioned. Total home range of these animals is unknown, since no wolves in the vicinity of the study area are radio-collared at this time. Size of wolf home ranges in the Upper Peninsula are variable and dependent on prey density, seasonal movements of primary prey, and a variety of other factors. Historically, wolves are not known to commonly inhabit the study area in winter; however wolves have been located during winter in nearly every direction from this area (Recovery of Wolves in the Great Lakes Region of the United States, *In Press*). This is likely the result of having annual snowfall in the study area which causes the wolves' primary prey (deer) to move to areas with higher conifer components or lower overall snowfall. It's highly probable that study area wolves follow deer to these sites during periods of high snowfall.

Summary

We used the methods of track-transect, remote camera, visual sightings, and recent historical harvest documentation to determine which large mammals were present on the study area. We used the assumption that large home range species of mammals have less need for specific within-stand habitat requirements, especially during non-winter periods. In consideration of the above, we assumed then that direct sightings, spoor, photo identification, and recent historical harvest records will yield an accurate picture of which large mammals are present. Using these methods we were able to identify 10 different large mammal species that were present along the survey route for at least part of each calendar year. These are white-tailed deer, moose, coyote, gray wolf, black bear, raccoon, bobcat, red fox, fisher, and otter. Predictably, the ubiquitous whitetail deer was the most common mammal and examples of less common species present in the study area are pine marten, fisher, and gray wolf. Interestingly, of the ten species identified, four (40%) were species that had been extirpated and have recolonized this area in recent decades. These species are moose, fisher, marten, and gray wolves. This recolonization was the result of deliberate release of moose, fisher, and marten by MDNR (formerly Michigan Department of Conservation) and in the case of gray wolves, natural recovery due to immigration from established populations elsewhere in the western Great Lakes states and provinces of Canada.

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James Hammill is a wildlife biologist. He served as Field Biologist and Wildlife Management Unit Supervisor for the Michigan Department of Natural Resources for 30 years (1972-2002). In 2002 he retired, and with his wife, Julie, formed Iron Range Consulting & Services Inc. The company's mission is to provide wildlife and timber management services to private forestland owners. Another key element of the company's business deals with direct wildlife consulting, irrespective of habitat conditions. Hammill has been involved with wolf recovery and management for much of his professional career. Examples of this work include:

- Responsible for the State of Michigan's wolf program, 1989-2002.
- Trapped, radio-collared, and monitored gray wolves in the Upper Peninsula of Michigan, 1994-2002.
- Trained trappers/trackers and coordinated Michigan wolf census (1989-2002).
- Gave public presentations on wolf biology and management to approximately 2,000 persons/year from1989 to 2002.
- Authored numerous scientific and popular articles on wolves and wolf biology.
- Member of the State of Michigan Wolf Recovery Team.
- Member of the Federal Wolf Recovery Team.
- Authored portions of the Michigan Wolf Recovery Plan.
- Reviewed Montana, Idaho, and Wyoming wolf recovery and management plans for U.S. Fish and Wildlife Service.
- Sat on numerous panels on wolf management and gave presentations on wolf management in the U.S.
- Worked under contract with the National Wildlife Federation to determine presence of wolves in Maine (2003).
- Member of the Board of Directors, International Wolf Center, Ely, Minnesota.
- Attended wolf handling courses and taught handling and trapping techniques to others.
- Currently working on wolf habitat suitability study for the State of New York.

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